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THE ECOLOGY OF FRANCESCO: SUSTAINABILITY REPORT OF "THE ECONOMY OF FRANCESCO" GLOBAL EVENT*

Michele Milan[1], Tommaso Barcaro[1], Massimiliano Muggianu[2], Giuseppe Lanzi[3]**

[1]Merieux Nutrisciences, Vicenza, Italy
[3]Oikuria, Vicenza, Italy
[3]Sustainability Coordinator for "The Economy of Francesco", Sisifo Società Benefit, Vicenza, Italy

Abstract

The goal is to describe the methodology and the results obtained from the Carbon Footprint (CF) analysis of the event "The Economy of Francesco 2022". To achieve this goal, the technical standards UNI EN ISO 14040:2021, UNI EN ISO 14064-1:2019 and UNI EN ISO 14067:2018 were used. Starting from the activity data collected and using the IPCC algorithm, the CF of the event was calculated equal to 27 tons CO_2 eq, which outlined a remarkable amount of emissions avoided thanks to the decisions taken. In percentage terms, 58.73% of the impact is attributable to materials, 0.15% to electricity, 8.34% to waste and 32.75% to overnight stays. From this it emerges that the total tons CO_2 eq are mostly attributable to the materials used followed by overnight stays and waste. Finally, from the data collected on the waste produced, it can be seen that the overall percentage rate of waste differentiation is greater than 90%, of which 75% is the organic fraction sent for composting.

Keywords: Assisi, carbon footprint, environmental impact, integral ecology

1. Introduction

The organization of an event occurs within economic, environmental, and social contexts specifically selected for its successful execution, offering something unique and continually evolving. Simultaneously, an event generates various impacts, such as those related to material procurement, electricity consumption, and waste production, which are

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** Corresponding author: e-mail: progetti@sisifo.eu

inevitable during the event's setup, execution, and dismantling phases. It is crucial, during the event's planning and subsequent phases, to declare the commitments, objectives, and actions that the organizing committee intends to implement to enhance the event's environmental and socio-economic performance throughout its life cycle (Holmes et al., 2015). Therefore, it is essential to adopt recognized and replicable methodologies for event management to quantify and communicate the generated impacts, providing a benchmark and comparison in case of future repetitions. The organization of an event must, therefore, focus on maximizing positive impacts (benefits) while minimizing and mitigating the negative ones. In this regard, identifying and selecting feasible environmental, economic, and social solutions with genuine added value is crucial (Laing and Frost, 2010).

The objective is to present the results obtained from the actions and sustainable management of the event "The Economy of Francesco," held in Assisi from 22 to 24 September 2022 (Francesco Ecology, 2022; Pope Francesco, 2019). The aim is to quantify both the emissions generated (tons CO_2 eq) during the event and the avoided ones, thanks to the planned mitigation actions.

3. Materials and methods

The methodology used to calculate the event's emissions follow to the UNI EN ISO 14064-1, 2019; UNI EN ISO 14067, 2018; UNI EN ISO 14069, 2017 standards. The system boundaries encompassed all processes and materials considered in the impact assessment, with this study specifying the period from 21 September 2022 to 24 September as the timeframe. The functional unit, representing all inputs and outputs, was defined as the event itself.

Carbon footprint (CF) calculations were conducted proactively to anticipate the expected impact and identify mitigation measures. This allowed us to ascertain the actual emissions generated and the impact mitigated (UNEP, 2009). The data used for quantification fell into two categories:

- Primary data: gathered through interviews, questionnaires, and supporting documentation (e.g., invoices). These data points were collected before, during (e.g., recycling, meals, overnight stays), and post-event (covering energy and water consumption).
- Secondary data: sourced from Ecoinvent, a scientifically validated database.

Certain data, such as participant travel to and within Assisi and information related to dinners not provided by event organizers, were excluded from the study due to the organizers' inability to control and monitor them. Including assumptions and hypotheses regarding these data would risk inaccurate overall reporting. Thus, we decla--re that these data will not be presented in this document. The collected data (inventory) underwent further processing using the IPCC calculation method (2021). The chosen indicator was the Global Warming Potential (GWP) index over a 100-year period (IPCC, 2021).

4. Results and discussion

The results were divided into the following cost centers: material, electricity, water, waste, and overnight stays. The matter includes what concerned the fittings, the use of plastics and bottles, gadgets (pen, notebook, backpack). For the preparation of the event, the use of reusable wooden pallets was chosen, which brought an environmental benefit when compared with the emissions generated using traditional panels (Schlenker et al., 2010) (Table 1). The wooden pallets (PEFC certified) reused following the event generated a saving of 109.5658 tons CO_2 eq compared to traditional panels (Table 1). Table 2 displays the results achieved through the utilization of biodegradable and compostable materials in comparison to the outcomes stemming from the use of conventional plastics. An exception is represented by the cardboard box, which has been disposed of in the paper recycling chain. Products crafted from

biodegradable and compostable materials contribute to lower carbon footprints (CF) than their traditional counterparts, offering an environmental performance advantage for the event (UNI EN 13432, 2002). Furthermore, the composted material contributes to soil redevelopment, which is an increasingly valuable resource, and the performance advantage is also logistical, because it facilitates separate waste collection (Barthe et al., 2017).

Table 3 illustrates the advantages stemming from the utilization of reusable bottles. The environmental burdens associated with the production of reusable bottles are amortized and distributed based on the bottle's useful lifespan. Likewise, the impact of PET bottles was assessed, considering the estimated average daily water consumption.

Table 4 presents the outcomes achieved through the adoption of a kit comprising a sustainable notebook made of FSC-certified paper, a pen crafted from biodegradable and compostable materials, and a cotton backpack, in comparison to those potentially obtained through traditional alternatives. Once again, the corresponding savings in terms of tons CO_2 eq, when compared to traditional options, are provided.

Table 1. Comparison between traditional pallet emissions and ones related to the event

Material	***Unit of measure***	***Value***
Pallet panels	tons CO_2 eq	7.4717
Traditional Panels	tons CO_2 eq	117.0375
Total CO_2 not emitted	tons CO_2 eq	-109.5658

Table 2. Comparison between materials

Material	***Unit of measure***	***Biodegradable***	***Traditional***	***Saving***
Silverware	tons CO_2 eq	0.1150	0.1850	-0.07
Glasses	tons CO_2 eq	0.6405	1.2820	-0.6415
Palettes	tons CO_2 eq	0.0050	0.0099	-0.0049
Food box	tons CO_2 eq	4.1101	5.0358	-0.9257
		Recyclable		
Cardboard box	tons CO_2 eq	0.3516	0.3516	0
Total	tons CO_2 eq	5.2222	6.8643	-1.6421

Table 3. Comparison between reusable and traditional disposable PET bottles

Material	***Unit of measure (UoM)***	***Value***
Bottles 500ml	tons CO_2 eq	0.0017
Pet bottles 500ml	tons CO_2 eq	0.0919
Total CO_2 not emitted	tons CO_2 eq	-0.0902

Table 4. Comparison between the supplied sustainable kit and a traditional one

	UoM	***BIO/FSC/Cotton***	***Traditional option***	***Saving***
Quill	tons CO_2 eq	0.0134	0.0164	-0.0030
Notebook	tons CO_2 eq	0.0449	0.0493	-0.0045
Backpack	tons CO_2 eq	0.2531	3.3572	-3.1041
Total	tons CO_2 eq	0.3114	3.4229	-3.1115

Table 5 shows the impact deriving from the food products used in the preparation of lunches, which we recall coming from companies that operate on assets confiscated from organized crime, on the seismic crater of Umbria and from companies settled in the local area. The number of meals consumed was 3437. It is worth mentioning that a further element of emission control is also the decision not to implement meat in meals preparation. Table 6

shows the results related to the separate collection of the waste generated during the event, performed with consequent controlled management, according to the type of waste, and compared with the results of a hypothetical uncontrolled management. Table 7 shows the benefits deriving from overnight stays performed in accommodation facilities such as hostels and hospitality houses. As shown in Table 8, a monitoring campaign has been launched focusing at electricity and water consumption. At the time of definition and implementation of the event, it was not possible to proceed with mitigation actions (e.g., 100% use of renewable energy) since the activities took place in spaces where there were already active utilities beyond the control of the organizers. The CF recorded for the event is 27.20 Ton CO_2eq with the following percentage contribution, as shown in Table 9. Below is a summary of the expected emissions and those actually produced with regard to the materials used, electricity, transport, water, waste and the overnight stays of the young people who attended the event, and all the staff involved (Table 10).

The final results of the calculated impact are definitely lower than the forecasts. This was possible thanks to an efficient use of resources within the premises used for the event. Particular importance was given to energy saving, favored by the reduced use of air conditioning systems and the choice of accommodation facilities other than hotels, for welcoming the participants. In addition to representing an advantage from an environmental point of view, this has made possible to obtain positive social implications, related to the establishment of connections between the participants (WCED, 1987).

Therefore, alternative solutions were studied with the aim of reducing and controlling the traditional impacts of the event. The areas of greatest intervention were therefore related to the choice of materials and suppliers, waste management and participants welcoming. These areas are also those in which the organization has the greatest control and decision power. The following table (Table 11) highlights the reduction of the impact, calculated in advance, compared to the adoption of traditional measures, or commonly adopted before a sustainability study. The final result therefore made it possible to highlight and verify that the mitigation actions and preventive measures, adopted upstream by the organizers, have actually led to a reduced impact compared to traditional practices and solutions.

Table 5. Carbon Footprint (CF) linked to catering

	UoM	***Value***
Traditional meal	tons CO_2 eq	4.1930
Sustainable meal	tons CO_2 eq	2.9733
Total CO_2 not emitted	tons CO_2 eq	1.2197

Table 6. CF linked to waste

	UoM	***Value***
Waste collected separately	tons CO_2 eq	2.2713
Waste not collected separately	tons CO_2 eq	2.6792
Total CO_2 not emitted	tons CO_2 eq	-0.4079

Table 7. CF linked to overnight stays

	UoM	***Value***
Hospitality houses	tons CO_2 eq	8.9120
Hotels	tons CO_2 eq	12.6717
Total CO_2 not emitted	tons CO_2 eq	-3.7597

Table 8. CF linked to electricity and water consumption

	UoM	***Value***
Electric energy	tons CO_2 eq	0.04150
Water	tons CO_2 eq	0.00003

Table 9. Total CF of the event

Cost centers	***UoM***	***Value***	***Value (%)***
Matter	tons CO_2 eq	15.98018	58.7398%
Electric energy	tons CO_2 eq	0.04150	0.1525%
Water	tons CO_2 eq	0.00003	0.0001%
Waste	tons CO_2 eq	2.27130	8.3488%
Overnight stays	tons CO_2 eq	8.91201	32.7587%
Total	tons CO_2 eq	27.20502	100%

Table 10. Expected and actual emissions with calculation of Delta value

Cost centers	***UoM***	***Forecasted***	***Actual***	***Δ***
Matter	Ton CO_2eq	58.35892	15.98018	42.37874
Electricity	Ton CO_2eq	358.59000	0.04150	358.54850
Water	Ton CO_2eq	2.35399	0.00003	2.35396
Waste	Ton CO_2eq	6.44646	2.27130	4.17516
Overnight stays	Ton CO2eq	47.23960	8.91201	38.32759
Total	Ton CO_2eq	472.98898	27.20502	445.78395

Table 11. Traditional and actual emissions with calculation of Delta value

		Traditional	***Actual***	***Δ***
Matter	Ton CO_2eq	128.1867	15.98018	112.2065
Electricity	Ton CO_2eq	0.04150	0.04150	0.00000
Water	Ton CO_2eq	0.00003	0.00003	0.00000
Waste	Ton CO_2eq	2.6792	2.27130	0.4079
Overnight stays	Ton CO_2eq	12.6717	8.91201	3.7597
Total	Ton CO_2eq	143.5791	27.20502	116.3741

5. Concluding remarks

The study reveals that matter and overnight stays had the most significant impact on overall performance of the event considered (46% pallets, disposables 32%, catering 19%). 112 tons CO_2 eq were saved using compostable products and responsible supply chain; 3.7 tons CO_2 eq choosing local partners and low-consuming accommodation facilities.

Overall, the study highlights the importance of evaluating environmental performance from a carbon footprint perspective, using an environmental and economic cost centers inventory and modeling approaches based on calculation algorithms.

The findings can help define a methodology for identifying suitable mitigation solutions and serve as a reference for other events.

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